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HVFA in the Madera Proejct:
A Green & Profitable Residential Community

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HVFA in the Madera Project:
A Green & Profitable Residential Community Development

Using fly ash in residential and commercial developments is practical, helps our environment, and improves hardened concrete properties.

The Madera Project, being developed by Green Trust, LLC, consists of 88 homes built on a 44 acre site in Gainesville, FL adjacent to the University of Florida. The University of Florida's Energy Extension Service (FEES) is participating in the design and development of this eco-friendly, resource-efficient community under the direction of Professor Pierce Jones. The community's three custom homebuilders will be Carter Construction, Edinborough Developments, and Brooks Design. The Madera project will be used to educate developers and contractors about specific environmental construction practices that can increase sustainability and construction efficiency, and reduce future homeowners' long-term maintenance costs. The project will also increase homeowners' awareness and utilization of energy-saving and recycling practices. High volume fly ash (HVFA) concrete is one of the technologies used in the project to promote resource-efficient construction.

Rinker Materials supplied Carter Construction of Gainesville with two 3000- psi HVFA mix designs utilizing ASTM C-618 Class F fly ash, supplied by ISG Resources, Inc., and ASTM C-150 Type II cement. Both mix designs maintained typical residential water to cement ratios and did not require special admixtures to increase workability or decrease initial setting time. Material costs for both mix designs are low enough to be competitively used in most ready mix markets.

The first building to be constructed at Madera Community will be the model center. The design for the foundation of Madera's model center is monolithic, meaning the footing and the slab were poured at the same time without isolation joints or cold joints. A 40% Class F fly ash concrete mix was used in the foundation and patio slabs. Placement of the foundation commenced at 7:00 a.m., and Rinker Material's trucks pulled off the job at 10:00 a.m.. Carter Construction's three finishers started floating and trowling the slab surface at 11:00 a.m., and the finishers had their tools packed by 3:00 p.m. Approximately 80 cubic yards of HVFA concrete was placed in the foundation with a 28 meter boom pump.

The exterior walls of the model center were formed with insulating concrete forms (ICFs), a building system that uses concrete as the main structural member. ICFs are hollow building blocks made of expanded or extruded polystyrene. The blocks stack on top of each other and the interior and exteriors are braced with plastic or metal web ties. The ICFs used in the model center had a 4-inch inside dimension. A 60% Class F fly ash concrete mix was used in the exterior walls. Concrete slumps greater than six inches were needed so the concrete could flow

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through the ICFs. This need was met by using the 60% fly ash concrete mix. Approximately 33 yards of HVFA concrete were placed in the exterior walls using a 2-inch line hydraulic pump. Wall compressive strengths averaged 3650 psi at 28 days.

Both mix designs performed exceptionally well on the job site, having compressive strengths which exceeded 3000 psi at 28 days and did not increase Carter Construction's labor or material expenses. The concrete finishers were pleased with the concrete's workability, set time performance and finished appearance.

Approximately 18 tons of fly ash were used to replace cement in Madera's model center, which reduced CO_2 emissions into the atmosphere by approximately 18 tons. The production of cement emits approximately one ton of CO_2 per ton of cement produced into the atmosphere. Over 500 cubic feet of landfill space were saved by using fly ash as a cement replacement in the model center. Fly ash not used beneficially, such as for cement replacement, consumes precious landfill space throughout the country.

Using fly ash in concrete increases concrete density, reduces permeability, ultimately produces higher compressive strengths, and inhibits sulfate attack, alkali silica reactivity, and chloride attack, as compared to concrete without fly ash.

Submitted by:
ISG Resources, Inc.
10653 South River Front Parkway
Suite 300
South Jordan, UT 84095
Telephone: (888) 236-6236
E-mail: jward@isgresources.com